



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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Potential Environmental Contamination from the Use of Perchlorate-Containing Explosive Products

Reformatted December 2017

Memorandum

To: Blasting Contractors and Interested Parties

From: Janine Commerford, Assistant Commissioner, Bureau of Waste Site Cleanup, Massachusetts Department of Environmental Protection

Subject: Potential Environmental Contamination From the Use of Perchlorate-Containing Explosive Products

Date: September 15, 2008

Introduction

In recent months, the Massachusetts Department of Environmental Protection (MADEP) has detected perchlorate in a few drinking water supplies in Massachusetts, including three public water supply wells where nearby blasting operations appear to be the source of the perchlorate contamination. The purpose of this memorandum is to provide guidance on perchlorate and prevent contamination of drinking water supplies.

Background

Perchlorate is a chemical compound comprised of 1-chlorine and 4-oxygen atoms. The wide-scale production of ammonium perchlorate for use as a solid rocket propellant has led to the use of perchlorate compounds in a number of common products, including fireworks, airbag inflators, some paints and enamels, industrial chemicals, and explosives. Perchlorates are highly water soluble, and can travel significant distances in groundwater. Perchlorate can affect the function of the thyroid gland, which regulates the body's metabolism. Pregnant women and their fetuses, infants, children under the age of 12, and people with hypothyroidism are most susceptible to its potential effects. In July 2006, MassDEP promulgated a drinking water standard of 2 parts per billion or ppb, and notification criteria (Reportable

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Concentrations in soil and groundwater) for this contaminant under the state waste site cleanup regulations (Massachusetts Contingency Plan, 310 CMR 40.0000).

In response to detections of perchlorate in water supply wells in Massachusetts, MADEP is investigating surrounding sites and activities that may have caused or contributed to contamination. Blasting operations employing perchlorate-containing explosives have been identified in at least three locations as the likely source of drinking water contamination.

Blasting Agents and Explosives

Perchlorates are present in some but not all blasting agents and explosives. They are found primarily in water gel and emulsion formulations. These products are used in difficult blasting applications, and contain sodium perchlorate, ammonium perchlorate, and/or potassium perchlorate as a sensitizing agent. Perchlorate-containing explosives typically have a high density and high explosive energy, making them suitable in wet/hard/dense rock blasting applications, or in general blasting applications to expand drilling patterns or to address excessive rock burdens. Additional situations where perchlorate-containing products are sometimes used include tight underground cuts, tight trenching applications, deep wet trenches, deep wet boreholes, and locations with high pre-compression conditions. The content of perchlorate in these products is variable, depending on the manufacturer, but can be 20% to 30% or more by weight.

Recommendations

Although the environmental impacts from the use of perchlorate-containing blasting agents and explosives have not been fully defined, MADEP believes it is prudent for contractors to take the following reasonable steps now to minimize potential problems in this regard:

1. **Determine the perchlorate content of blasting agents and explosives to be used** . This may require that you make inquiries with your suppliers and/or manufacturers.
2. **To the extent practical, avoid the use of perchlorate-containing explosive products when surface or groundwater can be affected with particular attention:**
 - Within and adjacent to the recharge areas of public drinking water supply wells (i.e., Zone II and Interim Wellhead Protection areas), and within and adjacent to the sensitive watershed areas of public drinking water supply reservoirs (i.e., Zone B areas). Maps of these areas should be available from local officials, and can be viewed on-line at [MassGIS](#) .
3. When the use of perchlorate-containing products is necessary:
 - **institute rigorous "housekeeping" practices.** Some sources suggest that explosive products that are properly detonated will result in the nearly complete destruction of perchlorates, and that loss of product via spills or debris are the primary cause of environmental pollution.
 - **take reasonable steps to prevent and address misfires.** In cases where explosives or blasting agents are washed or removed from a borehole following a misfire, reasonable efforts should be made to collect and properly manage or dispose of perchlorate-containing materials. In all cases, the safety of workers and the general public is of paramount concern.

Please contact Rose Knox at the MADEP Bureau of Waste Site Cleanup (BWSC) at 617-556-1026 or Rosemary.Knox@state.ma.us if you would like additional information.